PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Shogo HIROSE et al. Group Art Unit: 1797

Application No.: 10/667,339 Examiner: J. LEUNG

Filed: September 23, 2003 Docket No.: 117255

For: HONEYCOMB STRUCTURE, MANUFACTURING METHOD OF THE STRUCTURE, AND EXHAUST GAS PURIFICATION SYSTEM USING THE STRUCTURE

DECLARATION UNDER 37 C.F.R. §1.132

I, SHOGO HIROSE, a citizen of Japan, residing in Nogoya, Japan hereby declare and state that:

1. I am a named inventor in the above-captioned patent application.

2. I have a professional relationship with the assignee of the above-identified patent application. In the course of that professional relationship, I received compensation directly from the assignee for my work relating to Research and Development. I am being compensated for my work in connection with this Declaration.

3. I conducted the following experiments, using the following methods and achieved the following results.

4. General experimental conditions employed:

A series of DPFs (identified in the Section 5 below) were mounted in the exhaust system of a common rail type direct-injection in-line four-cylinder diesel engine, having a displacement of 2000 cc. The DPFs were mounted to repeatedly carry out the trapping/collecting of particulates and the regenerating steps described in Paragraph 0043 of the specification of the above application. Data was collected during the test to record pressure loss and to

determine changes in trapping/collecting efficiency with the elapse of operation time.

5. The DPFs used had a honeycomb structure having the diameter of 144mm, length of 152mm, partition wall thickness of 0.43 mm, and cell density of 16/cm^2. The honeycombs were plugged at one end of each through channel by a plugging portion, as shown in Fig. 6 of the specification. The through channels had slits having the dimensions shown in Table 1 below.

6. Testing conditions for trapping/collecting efficiency:

Each of the DPFs having the above-mentioned properties was mounted in the exhaust system of the above-mentioned common rail type direct-injection diesel engine to trap/collect the particulates, and was tested. A part of the exhaust gas was sucked and passed through filter paper in upstream and downstream of the DPF. A soot mass in the exhaust gas attached onto the filter paper was measured. Filtration efficiency (F%), which is sometimes referred to as trapping/collecting efficiency, was calculated by using the following equation:

$$F\% = \{1-(\text{soot mass in DPF downstream})/(\text{soot mass in DPF upstream})\} \times 100 \qquad (1)$$

7. Testing conditions for Pressure Loss:

Each of the DPFs having the above-mentioned properties was mounted in the exhaust system of the common rail type direct-injection diesel engine to carry out the trapping/collecting of the particulates, and the changes of the pressure loss were measured.

8. Furthermore, by using the series of the DPFs which were regenerated after accumulation of 7.5 g of particulates, the procedures listed in sections 6 and 7 above. were continued until an additionally 7.5 g of particulates were trapped/collected.

9. The data collected from these experiments is presented in Table 1 (below).

10. As shown in Table 1 above, the DPFs having the slit whose width and length

are outside the range of 0.2-1mm and 1-30mm, respectively, (Sample 10) showed poor filtration efficiency even when DPFs containing no accumulated particulates (@ = 0g) or the ones containing accumulated particulates of 7.5 g (@ = 7.5g) were used.

11. In case of the DPFs only whose width is within 0.2-1mm (Samples 6 and 7) showed poor filtration efficiency, while the pressure drop was not so high, irrespective of the presence or absence of particulates at the start of the test.

12. In case of the DPFs only whose length is within 1-30mm (Sample 10) showed poor filtration efficiency, while the pressure drop was not so high in both DPFs.

13. In case of the DPFs whose width and length are within both the 0.2-1mm and 1-30mm ranges, respectively, (Samples 3 to 5. 8 and 9) showed good filtration efficiency with acceptable pressure drop, in both DPFs.

14. In case of the DPF having a relatively narrow slit (Sample 2), at the initial stage, it showed a favorable performance, as is shown in Table 1, however, the pressure loss increased 1.2 times after the repetition of 500 cycles.

15. In case of the regenerated DPF having no slit (Sample 1), the pressure loss increased 1.3 times after the repetition of 500 cycles.

16. The DPFs having the slit whose width and length (Sample 3 to 5, 8 and 9) are within the ranges of 0.2-1mm and 1-30mm. respectively. can show the favorable performance after the repetition of 500 cycles.

Table 1

Sample #	Slit Width	Slit Length	Pressure Drop @ 0g	Filtration Efficiency @ 0g	Pressure Drop @ 7.5g	Filtration Efficiency @ 7.5g
Units	mm	mm	kPa	%	kPa	%
1	0	0	1.40	80	7.0	98
2	0.1	30	1.41	70	5.2	95
3	0.2	30	1.40	70	5.2	96
4	0.3	30	1.35	73	5.4	97
5	0.5	30	1.30	71	5.5	96
6	0.5	60	1.20	34	5.3	71
7	0.5	84	0.80	22	3.9	60
8	0.7	30	1.00	42	5.0	82
9	1.0	30	1.10	43	5.0	80
10	1.2	30	1.00	30	4.4	70
11	1.2	35	0.90	24	3.9	60

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and/or imprisonment under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Date: December, 1st, 2008

Shogo Hirose

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